Retrieval by Iconic Content from a Database of Radiology Reports

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Communicating the results of radiological examinations to refering physicians, and summarizing them for instructional purposes, has become considerably easier due to the conjunction of computing and communications networking technologies [1]. Major challenges arise, however, in making such results easily sharable in common, distributed workspaces [2]. Using a combination of images and schematic, graphical representations that summarize interpretive information (findings) can be most useful for querying in such image database environments [3]. We have shown that an iconic reporting system can serve as a powerful visual summary of the radiological findings from large sets of patient images with specific classes of problems, such as those refered for possibly orthopedic surgery of the knee [4]. In a study of 100 patients from two orthopedic practices we found that surgeons reported very high agreement (up to 96.4%) between findings derived from the iconic reports and from conventional text impressions dictated by the radiologist [4], [5].

We have built a database of the summary iconic reports and carried out a series of experiments in retrieval by content from this database, to determine how to minimize ambiguity in retrieving reports from visual iconic queries to the database. A database of radiological findings abstracted from the iconic reports was used as the standard of comparison. These results were validated by comparison with the same findings excerpted from the text reports, which were taken as the gold standard.

These studies show that retrieval by iconic content can be carried out with a high degree of reliability when visual templates have been designed to provide sufficient locational discrimination between distinct icons, and where the reporting radiologist chooses icons from distinctive size groups to account for significant differences in interpretation. Our experiments confirm that iconic reporting can be specified as a problem of selection (of icons and templates); classification (matching radiological image findings to the appropriate subset of icons) and localization (of the chosen icons on the template) in those situations where the medical problem domain is suffiently well defined and spatially constrained - as in the reporting of orthopedic problems in the knee and other joints [6]. The icons provide a natural means of visually indexing large image databases whose findings have been either annotated interactively, or derived analytically from specific image features and properties, such as shapes or arrangements [7]. Based on these results we are designing iconic radiology reports that can be placed on the internet together with the images of selected studies for radiological instruction, as we have already done with an MR image database [1]. This would augment existing computer-based radiology reporting [8], [9] by adding a rapid and effective visual means of summarizing information from large image databases, making them easily and widely disseminatable.

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